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Center et al.

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[45] **Date of Patent: Nov. 19, 1991**

[54] **METHOD AND APPARATUS FOR CLOSING BOTTOM END FLAPS OF A CARTON**

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[73] Assignee: **Frito-Lay, Inc.**, Dallas, Tex.

[21] Appl. No.: **398,807**

[22] Filed: **Aug. 25, 1989**

[51] **Int. Cl.**[5] **B31B 1/50**

[52] **U.S. Cl.** **493/183**; 493/453; 53/491; 53/374.7

[58] **Field of Search** 53/159, 374, 386, 491; 493/137, 139, 140, 121, 177, 178, 183, 136, 453, 1; 229/156, 157

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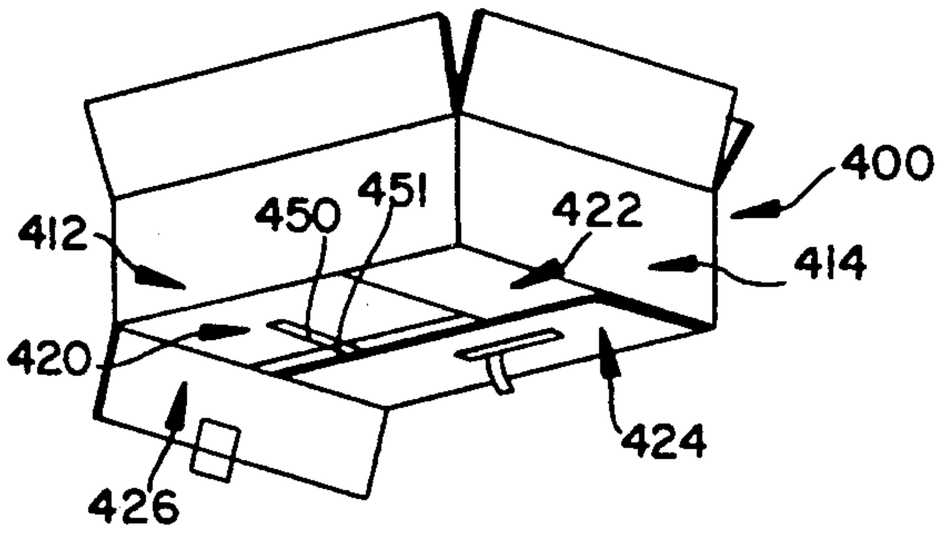
Primary Examiner—D. S. Meislin

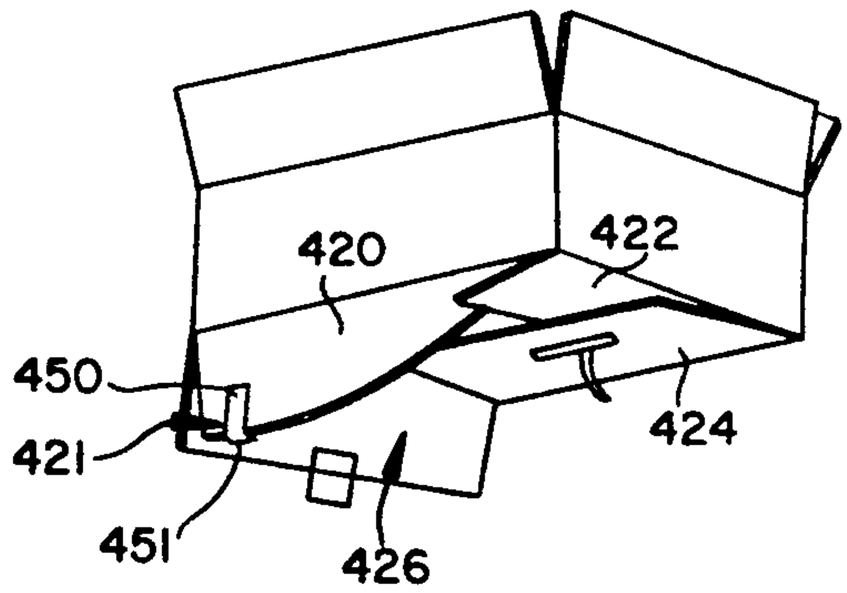
Attorney, Agent, or Firm—Rothwell, Figg, Ernst & Kurz

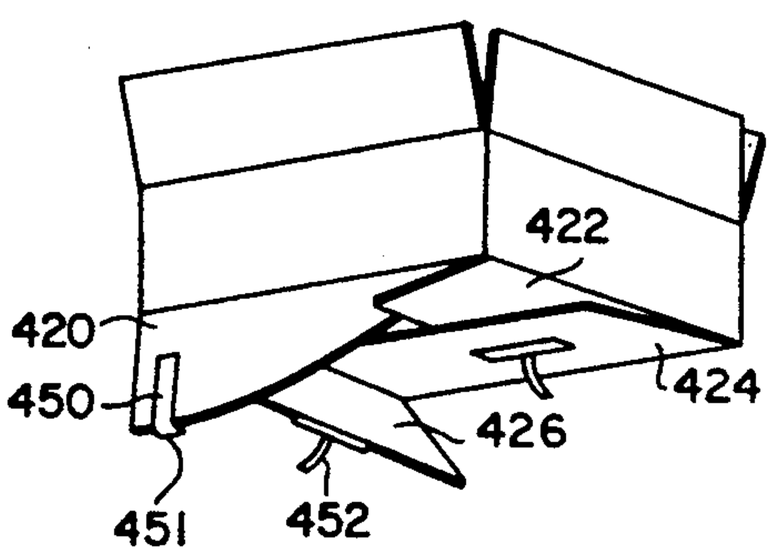
[57] **ABSTRACT**

A method and apparatus is disclosed for closing the bottom end flaps of a reusable rectangular carton whereby the carton is disposed in an expanded position with the bottom end flaps biased outward with respect to the carton sidewalls. A sequence controller is programmed to release the bias and fold each bottom end flap in a predetermined sequence. A closure is effected by disposing at least two end flaps in locking relationship to each other.

10 Claims, 8 Drawing Sheets







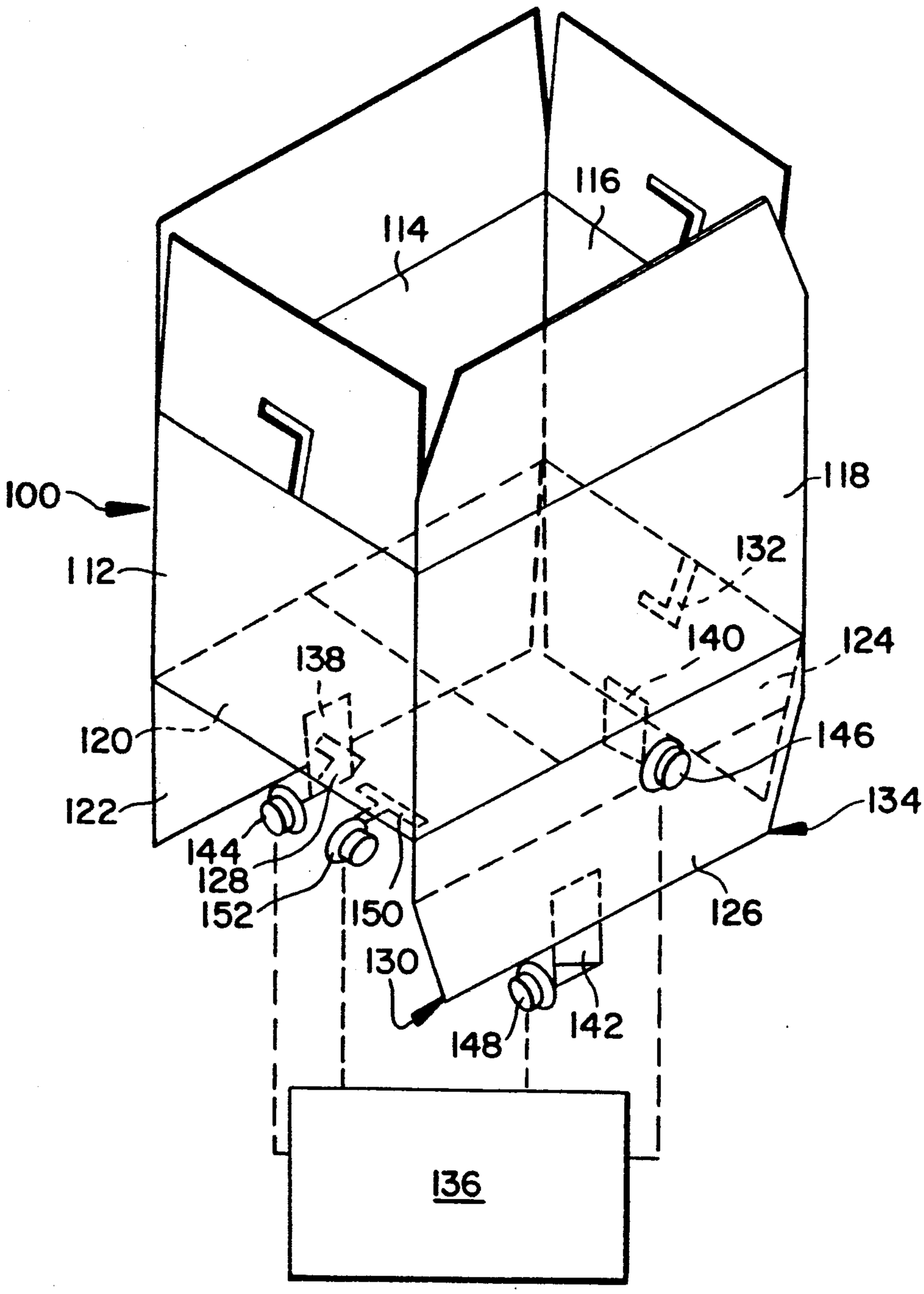

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FIG. 1A

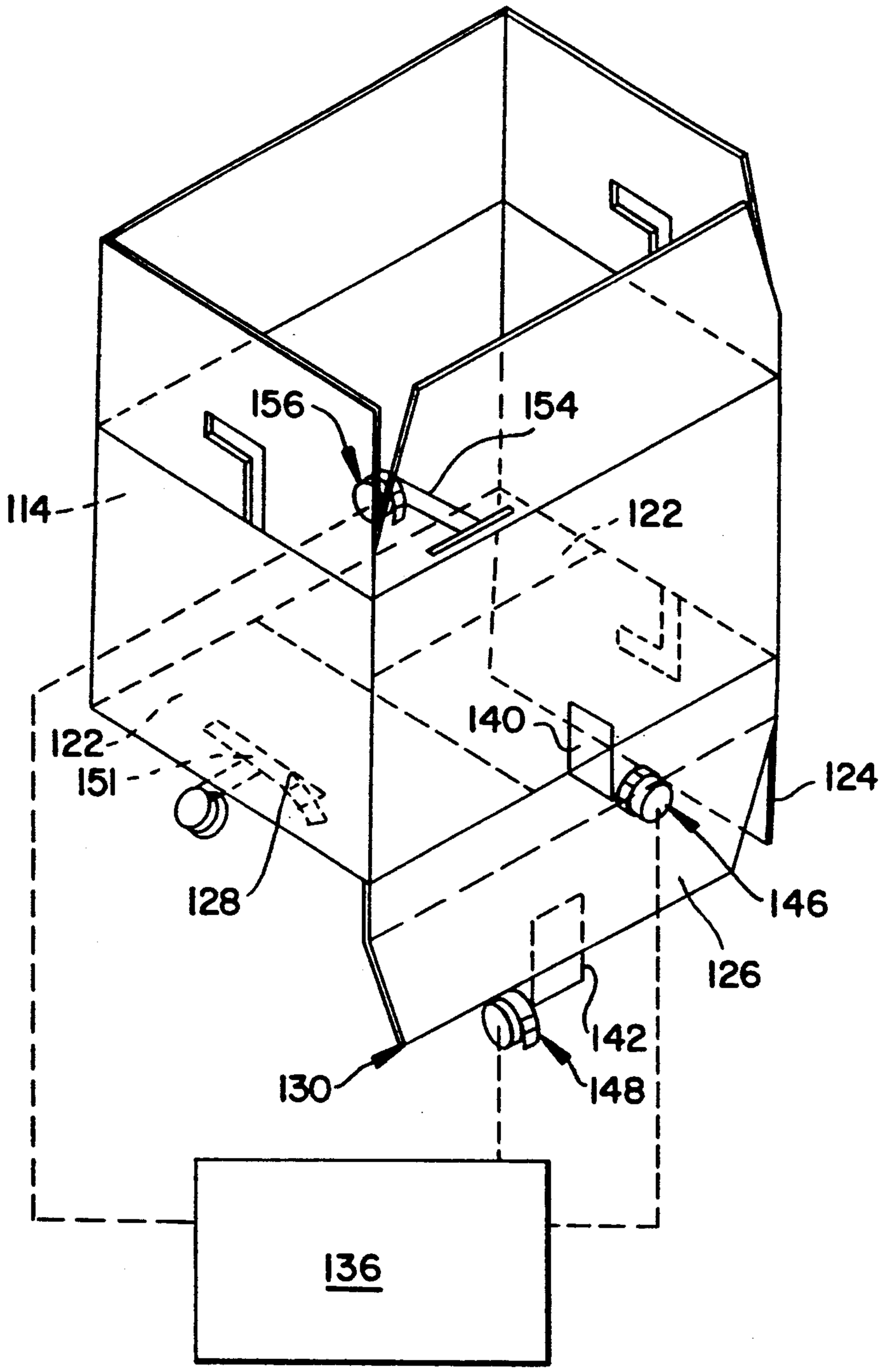


FIG. 1B

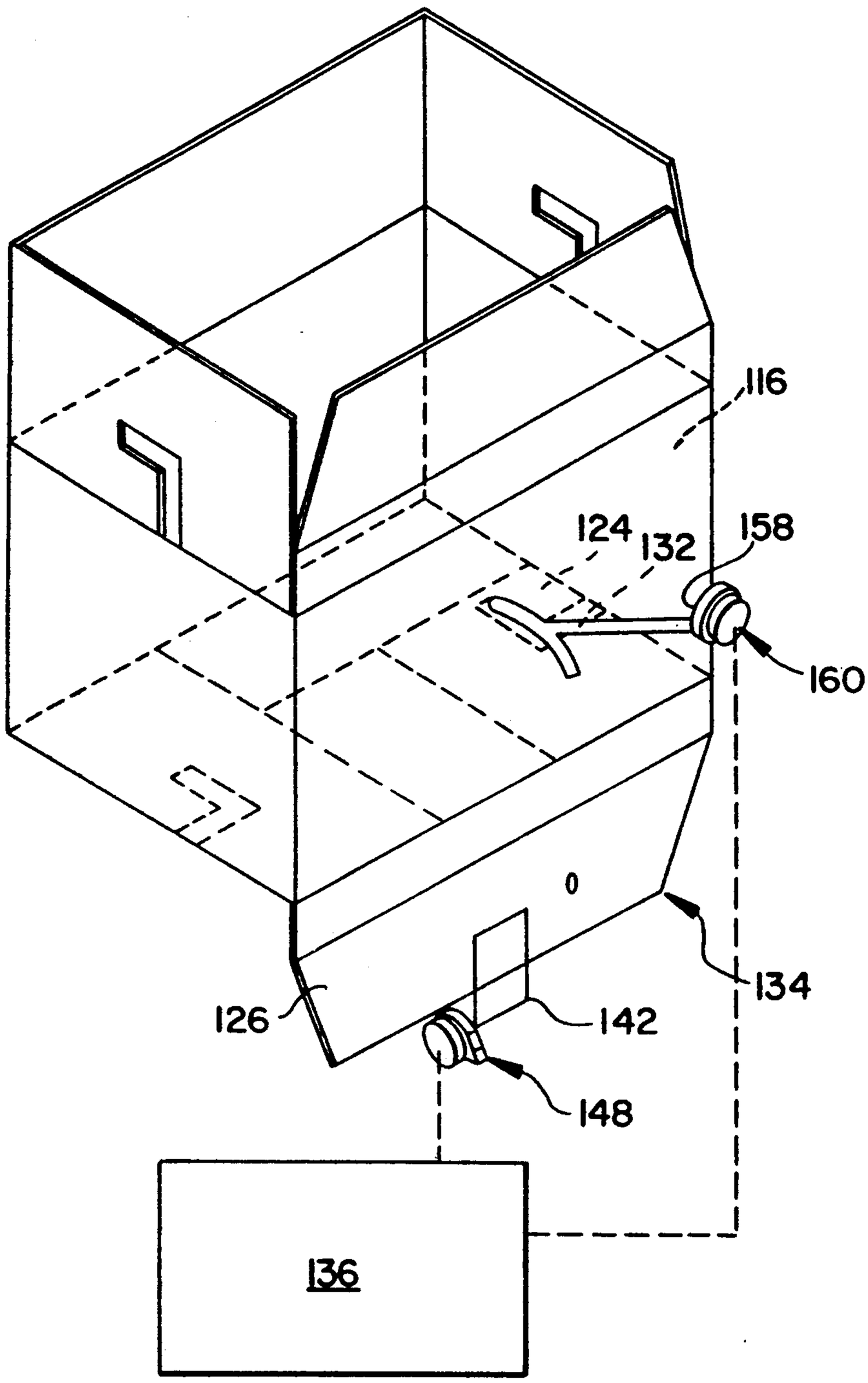
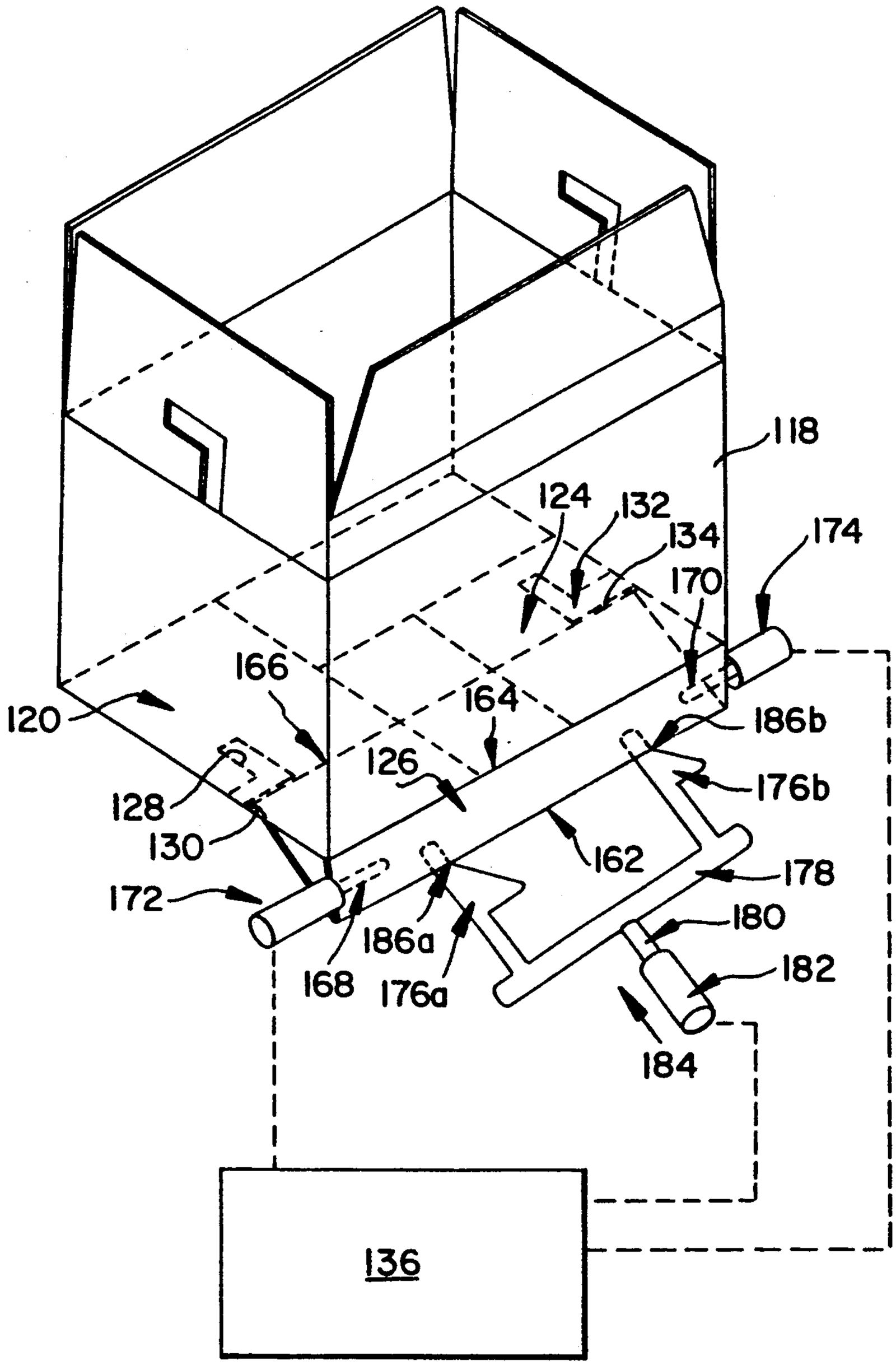


FIG. 1C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174
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126
176b
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172
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186a
182
168
176a
184
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FIG. 1D

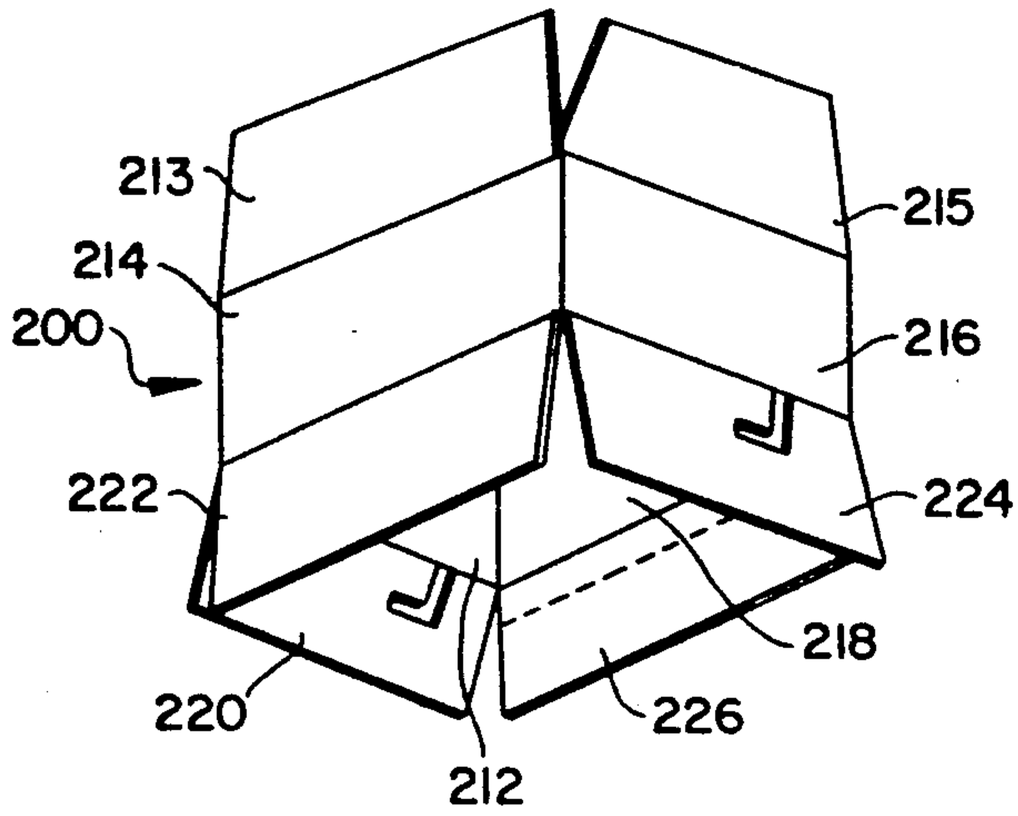
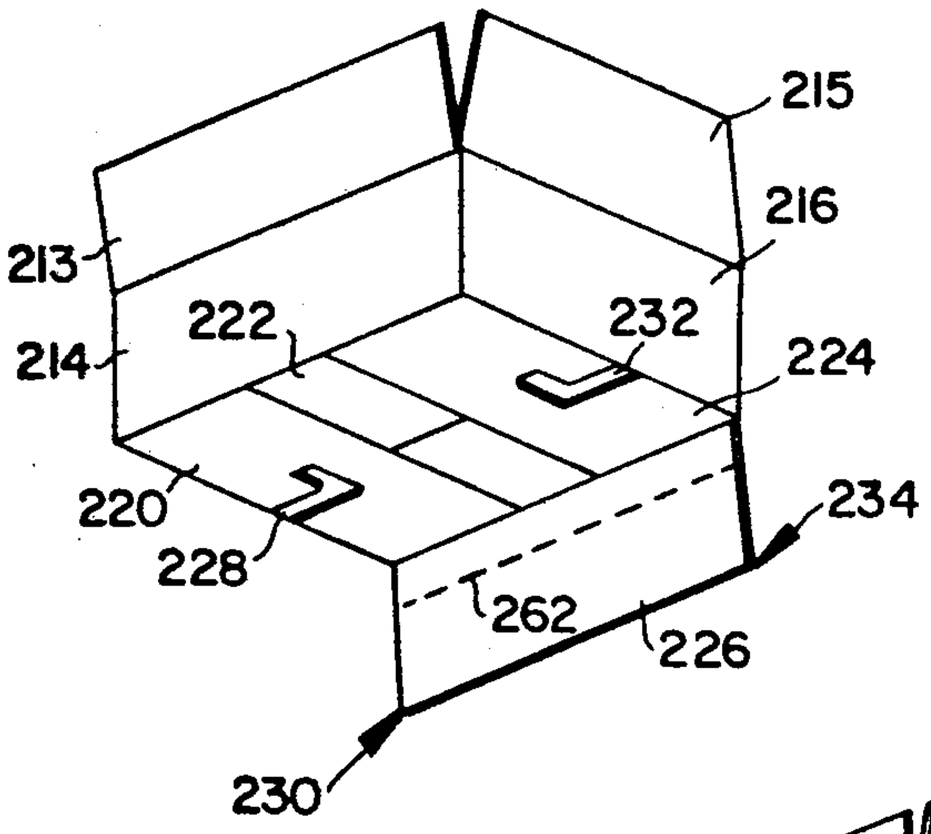


FIG. 2A

FIG. 2B



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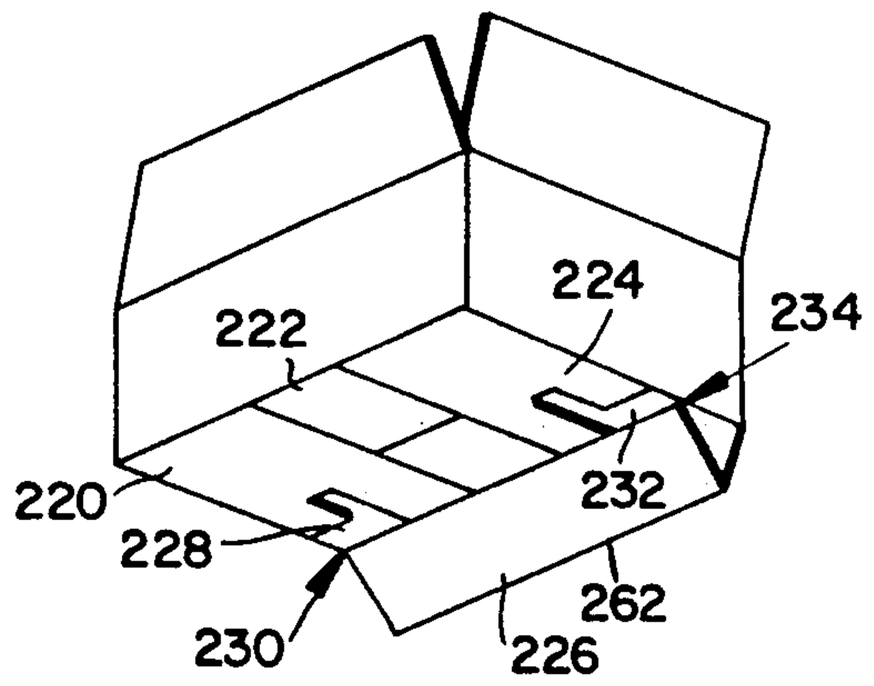

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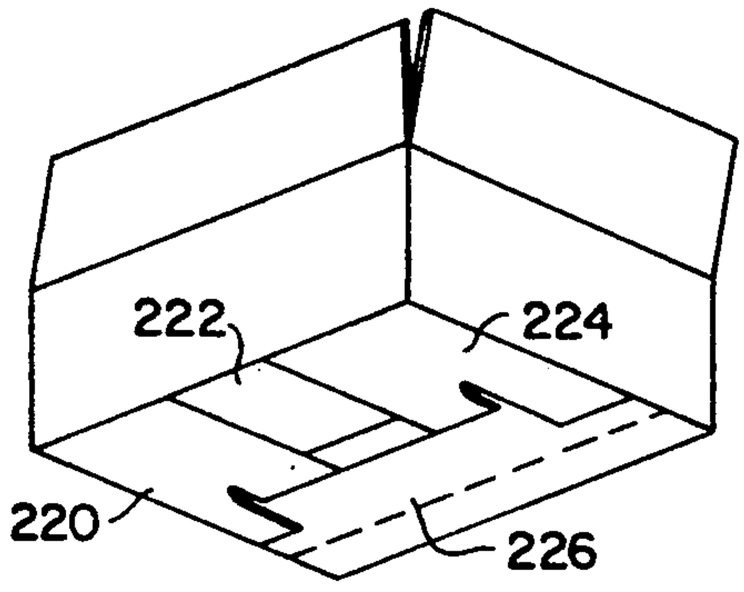


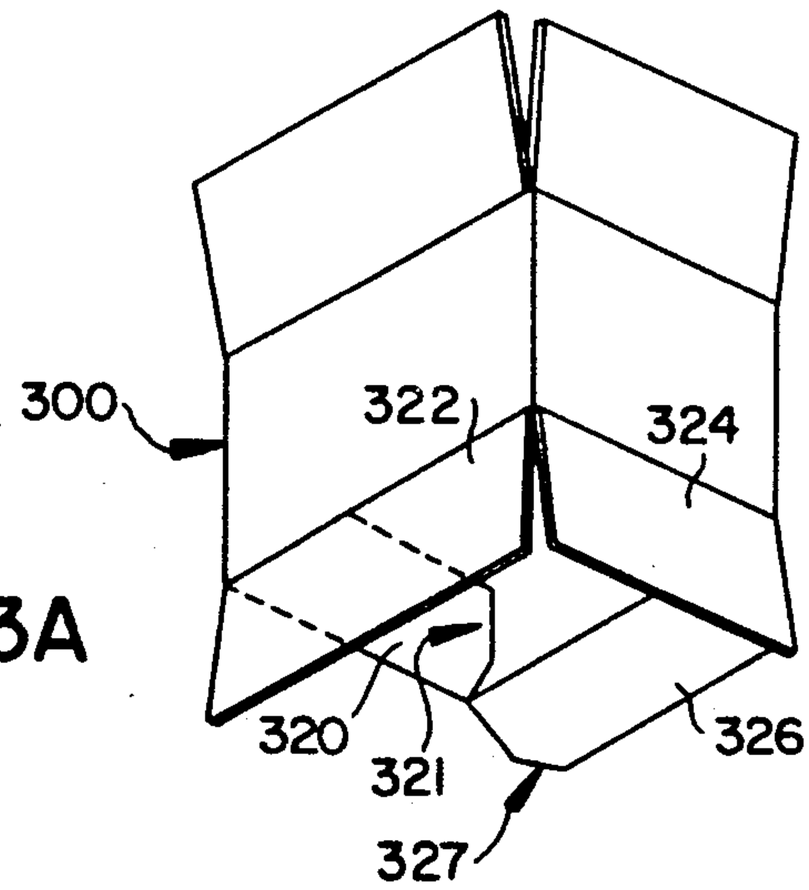


FIG. 3A

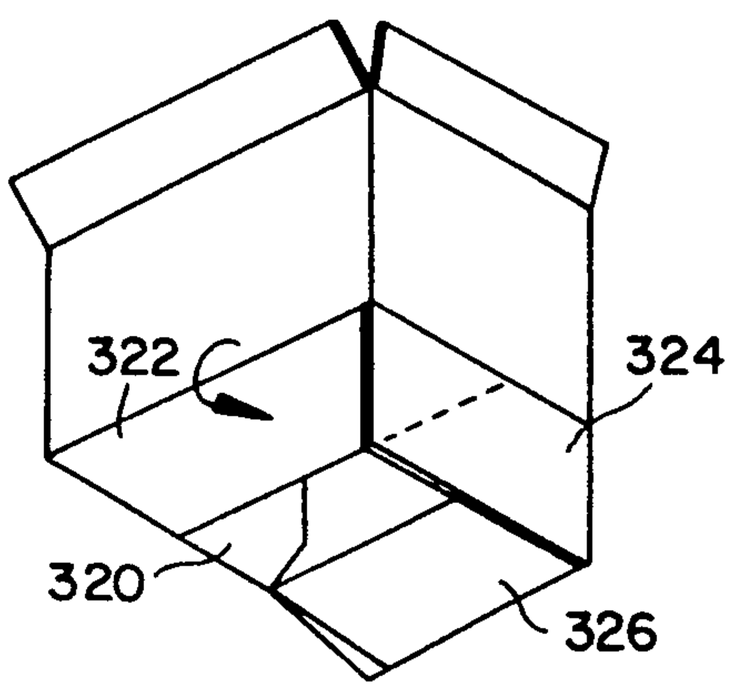


FIG. 3B

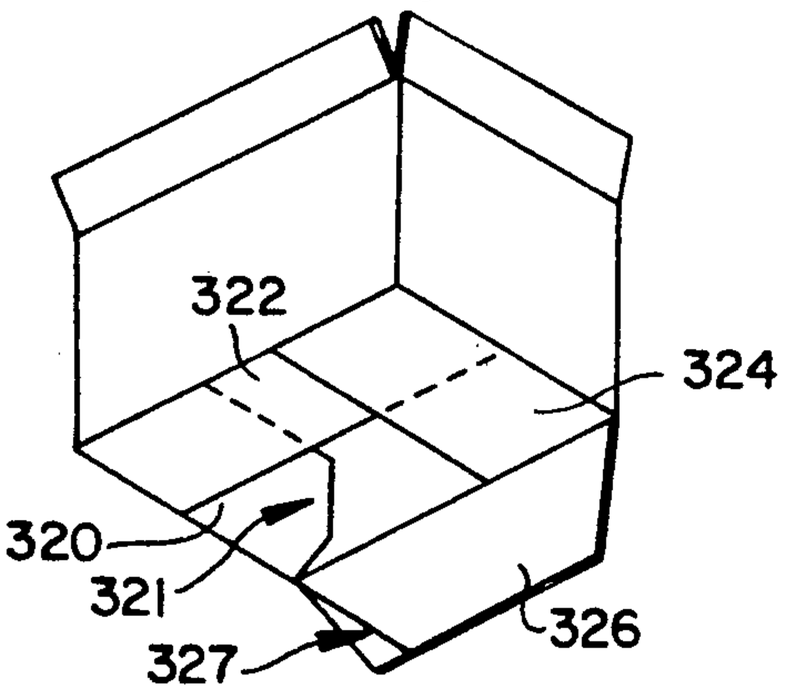


FIG. 3C

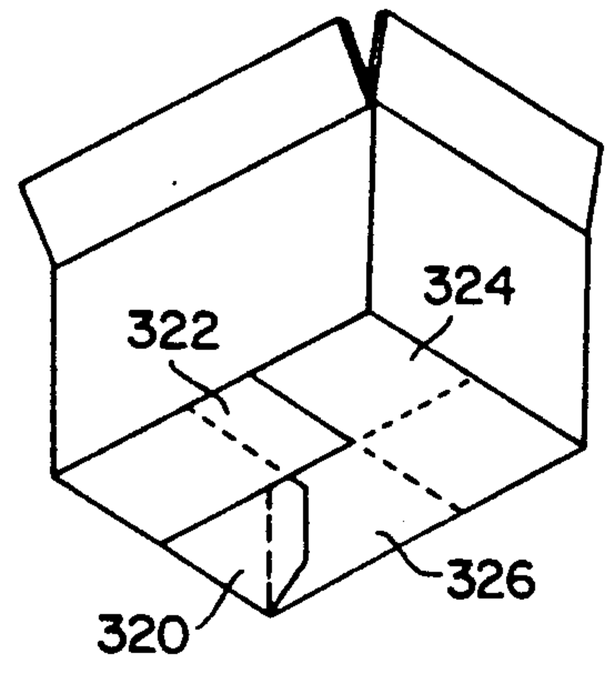


FIG. 3D

FIG. 4A

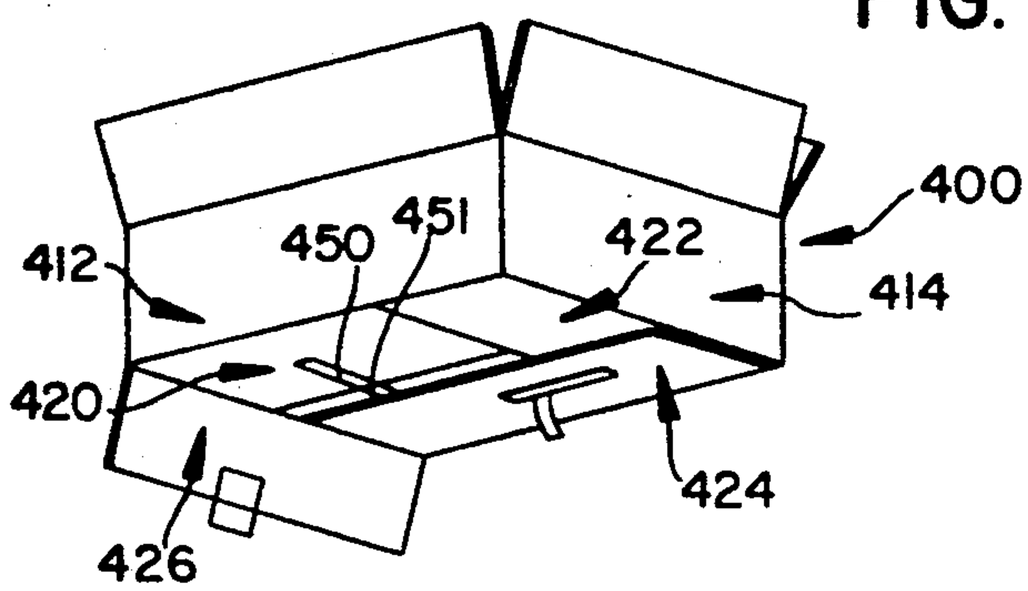
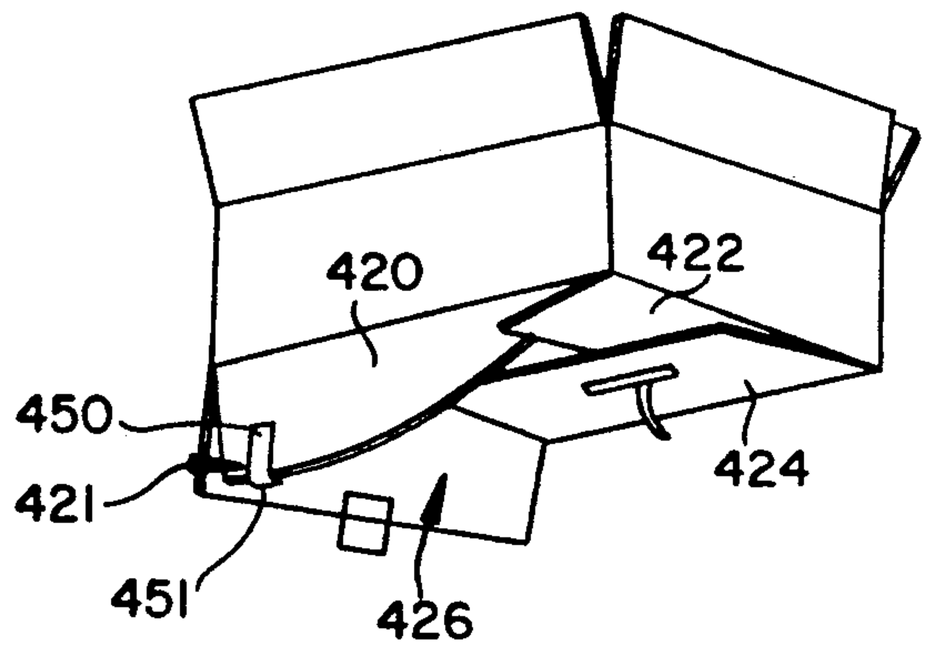


FIG. 4B



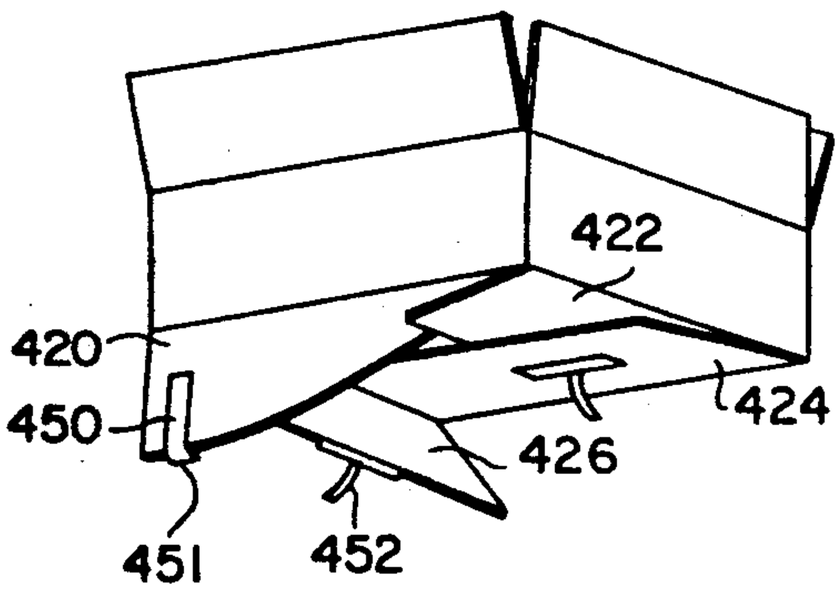


FIG. 4C

FIG. 4D

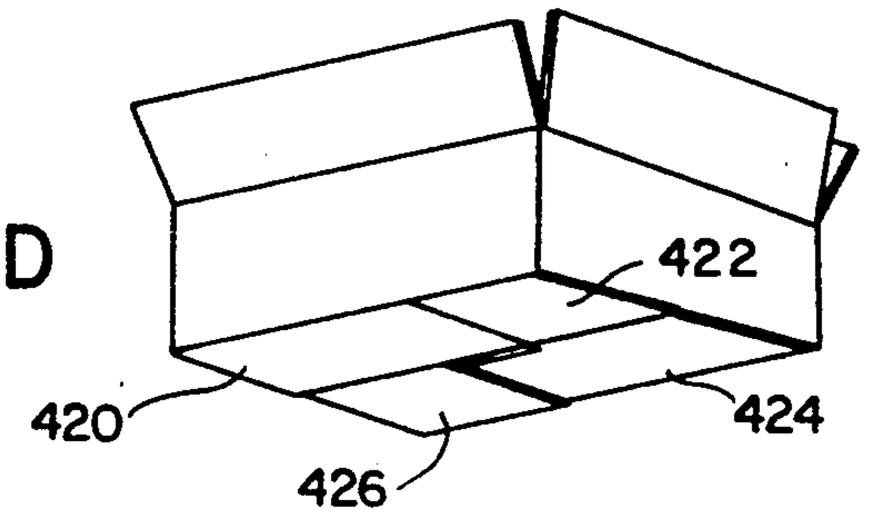
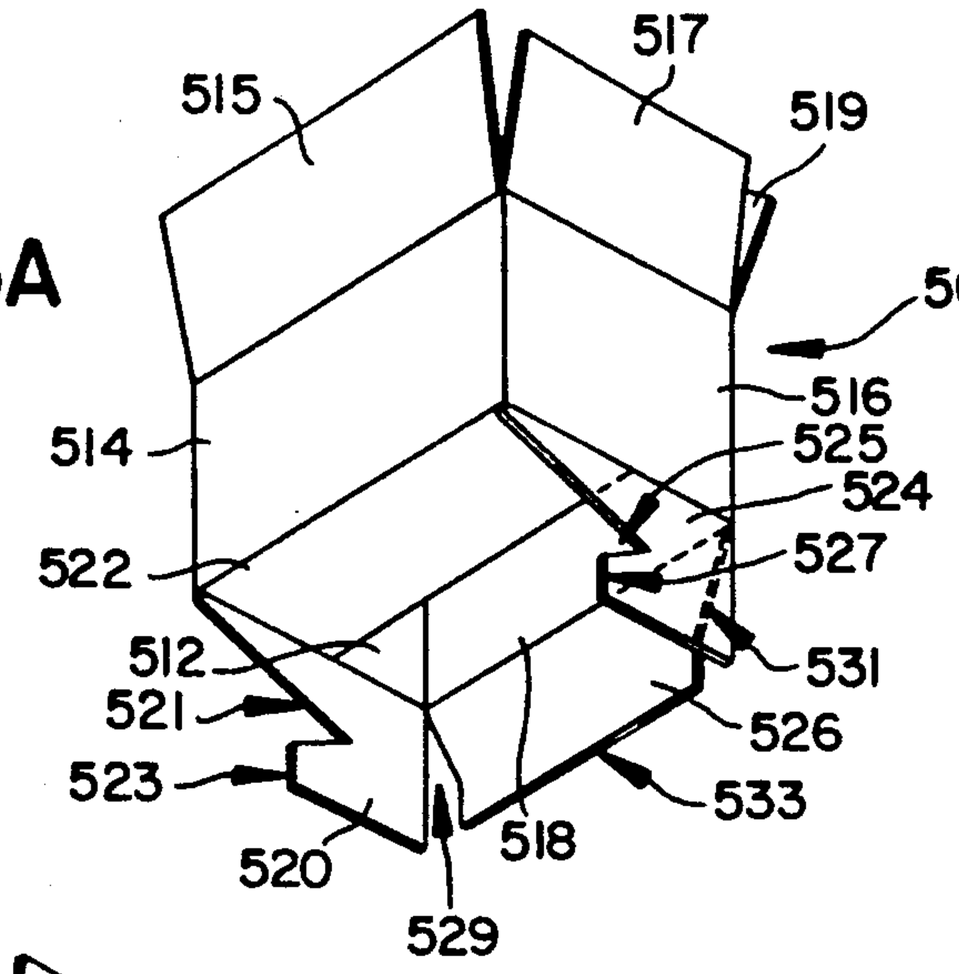


FIG. 5A



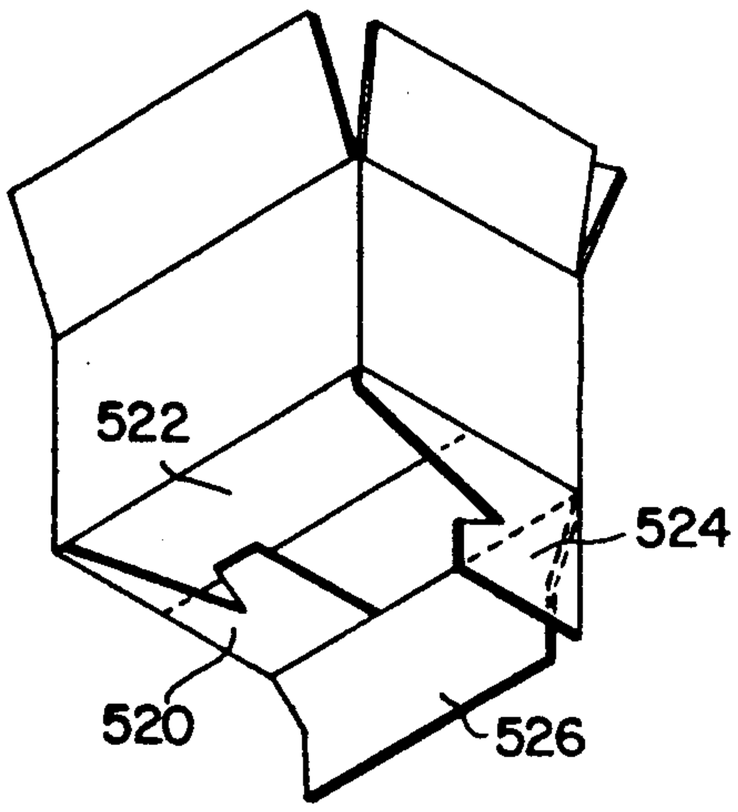


FIG. 5B

FIG. 5C

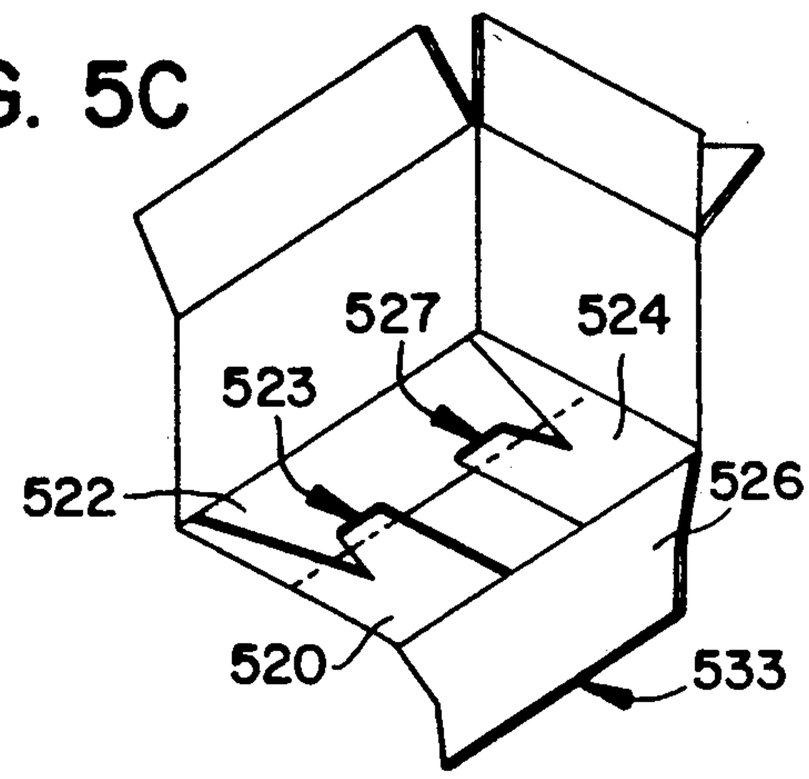
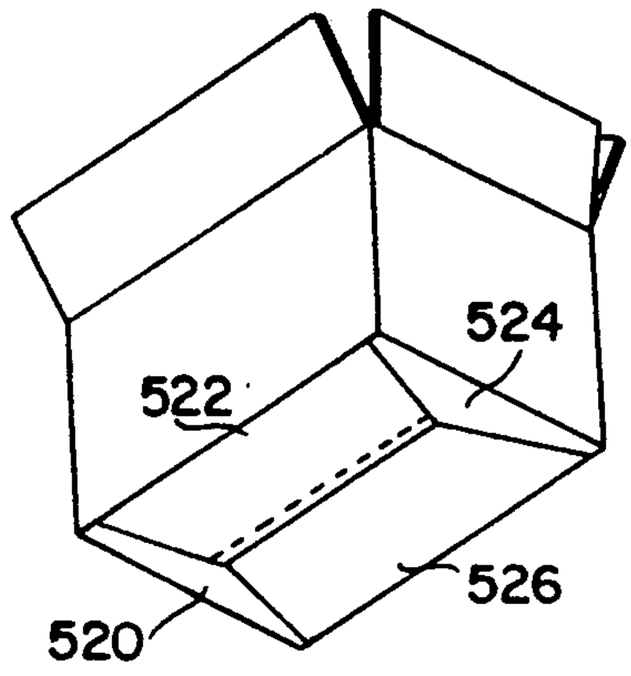


FIG. 5D



METHOD AND APPARATUS FOR CLOSING BOTTOM END FLAPS OF A CARTON

FIELD OF THE INVENTION

The present invention relates to a method and apparatus for closing multiple end flaps of cardboard cartons and the like.

BACKGROUND OF THE INVENTION

Rectangular cartons having foldable end flaps are used by Frito-Lay, Inc., the assignee of the present invention, and others to package bags of snack foods such as potato chips, corn chips, corn puffs and the like for shipment. Typically, the cartons are erected by hand and the bags of product are placed in the carton manually, afterwhich a manual fold is used to close the top of the carton. It is frequently desirable that the cartons be reused, so that destructive closure means for bottom and top closures are to be avoided. Thus, typical automatic devices for closing cartons having closable end flaps which utilize glue, staples, tape or other destructive closure means are not suitable for applications wherein the carton is expected to be collapsed after the bags of product are removed and returned for reuse. At the same time, the manual process of erecting, filling and closing cartons is costly.

Efforts have been made to automate the packaging of light weight fragile products such as bags of snack foods. An example of an automatic packaging device is disclosed in U.K. Patent Application 2,200,093 to Bishopbarn Ltd. entitled "PACKAGE HANDLING METHOD AND APPARATUS." However, such disclosures do not include an automated device for erecting a carton and creating a secure, reusable bottom closure. Accordingly, full automation of carton erection, wherein a reusable folded bottom closure is formed, the contents are placed in the carton and a folded top closure is made, remains lacking in the art.

One alternative known in the art is the use of folded cartons having an automatic opening and closing permanent bottom that is simultaneously formed when the carton sides are expanded to the desired geometry. The use of an automatic permanent bottom produces an excessive cost as the carton materials are significantly greater than a typical carton design, which reduces the feasibility of automation. Further, an automatic opening and closing permanent bottom case typically includes several additional folds within the flattened carton that add undue thickness to a portion of the folded carton, making stacking and handling of folded permanent bottom cartons awkward and problematic, especially when such cartons are intended to be collapsed, stored and returned for reuse.

It is desirable to utilize a simple box design with bottom fold closures to produce a secure bottom closure. Top folding closures and various automated methods for producing top closures are known in the prior art. U.S. Pat. No. 4,584,818 to Plaskett entitled "APPARATUS FOR AUTOMATICALLY CLOSING L-SLIDE LOCK CARTONS" as well as U.S. Pat. No. 4,656,810 to Plaskett entitled "APPARATUS FOR AUTOMATICALLY LOCKING L-SLIDE LOCK CARTONS" demonstrate automated devices that fold and insert a final flap into the L-shaped slots of adjacent end flaps and provide a secure top closure. It is noted, however, that the carton described in these patents is presented to the top closure mechanism with all flaps in a folded horizontal position perpendicular to the side walls of the carton.

What is lacking in the prior art is a means to provide automated fold closures for bottom end flaps of an open reusable carton.

Hence, it is an object of the present invention to provide a method for closing the bottom end flaps of a rectangular carton.

This and other objects of the present invention will be obvious to one skilled in the art from the below description of the invention and the attached drawings.

SUMMARY OF THE INVENTION

The present invention relates to a method for closing the bottom end flaps of a rectangular carton having sequentially adjacent first, second, third and fourth sides which form the body of the carton, the four sides having first, second, third and fourth bottom end flaps extending respectively therefrom, the method including the steps of:

(a) providing a carton in an expanded rectangular position having its bottom end flaps extending downward relative to the body of the carton;

(b) providing biasing means to bias said end flaps outwardly with respect to the sidewalls of the body of the carton;

(c) providing a sequence controller for sequentially controlling release of the biasing means and closing of the bottom end flaps;

(d) closing the bottom end flaps in a preset sequence under control of the sequence controller by releasing the bias and folding each end flap towards the interior of the carton while maintaining a bias on each unfolded end flap; and

(e) providing the end flaps in a secure position by means of disposing at least two end flaps in locking relationship to each other.

The sequence of end flap closing is determined with respect to the locking relationship to be utilized between end flaps to provide a secure closed carton bottom. The sequence of closing may be clockwise or counter clockwise fan folding, or may comprise first folding opposing major or minor end flaps followed by closing and securing of the remaining end flaps, or any desired sequence of closing that results in a secure folded bottom.

Means for disposing the end flaps in locking relationships may be L-slide lock arrangements, fan folding locking sequences, fan folding locks of modified end flap configurations, tab locking arrangements and the like.

In one preferred embodiment, the carton bottom end flaps are closed in a fan folded configuration and fan fold locked wherein the locking edges of the first and last end flaps are modified for ease of closing and to provide a secure closure. In another embodiment, the carton bottom end flaps are closed in a fan folded configuration and the finally folded end flap is secured to the first and third end flaps by means of L-slide locks. In yet another preferred embodiment of the invention, a first major end flap of the carton is folded, afterwhich two minor end flaps are folded inward, followed by the folding of the final major end flap which possesses a tab portion at the edge thereof providing tucking and securing means between each of the other three end flaps.

DETAILED DESCRIPTION OF THE INVENTION

In accordance with the present invention, there are provided means for receiving a flat, collapsed, reusable carton having foldable end flaps extending upwardly and downwardly from each side, in a generally upright position, and expanding the folded carton such that opposing side walls are parallel to each other and adjacent side walls are about perpendicular to each other. The four side walls define an interior space. The carton may be expanded by means such as air suction, mechanical cylinders, or pistons designed to pull or push the carton into its open position. The open carton has upwardly extending top closure flaps that remain in a generally upright position so that the carton may be filled. However, prior to placing any contents in the reusable carton, a folded bottom closure must be effected.

A highly efficient automated system is necessary to fold bottom closures. It is critical that the bottom closure be reliably and consistently effected so that when the carton i lifted the contents of the carton do not fall out due to an unsecured bottom closure. As disclosed herein, control of bottom end flaps has been found to be critical for automation of bottom carton closures. Bottom end flaps require positive restraint and outward biasing to prevent end flaps from interfering with the folding and closing of other bottom end flaps. Control is especially necessary in consideration that a carton may be a new unused carton having relatively stiff end flaps lying in approximately the same plain as their respective carton sides, or may be a worn reused carton whose bottom end flaps will exhibit varying degrees of folding when in an unrestrained position.

Effective automation of folded bottom closures must also avoid end flaps folding into the interior of the carton body, which is a special concern pertaining to the first folded end flap. If the first or other folded end flaps extend upwardly and away from a position generally perpendicular to the body sidewalls, it may be impossible to lock the end flaps and secure a bottom closure. Such is not a concern with folded top closures wherein the contents of the carton provide a support mechanism to maintain the end flaps outside of the interior of the carton.

BRIEF DESCRIPTION OF THE DRAWINGS

A method of making an automated effective folded bottom carton closure will be further described herein below with reference to the attached figures wherein:

FIGS. **1** A–D are perspective, schematic views showing fan folding of end flaps of a carton having L-slide lock slots receiving opposite free end corners of the final flap to lock the bottom closure securely;

FIGS. **2** A–D are perspective, schematic views showing the folded bottom closure of an L-slide lock arrangement wherein a first major end flap is folded prior to folding both minor flaps, afterwhich the second major end flap is folded and locked into L-slide slots disposed in the two minor end flaps;

FIGS. **3** A–D are perspective, schematic views showing a fan folded sequence for a returnable carton utilizing modified end flaps to form a secure bottom closure;

FIGS. **4** A–D are perspective, somewhat schematic views showing a fan folded arrangement for a reusable carton having conventional end flaps; and

FIGS. **5** A–D are perspective, schematic views showing a tab closure wherein a first major end flap is folded prior to folding both minor end flaps, afterwhich the final major end flap containing a tab portion at its free edge is tucked under and secured with the other end flaps to form a bottom closure.

DETAILED DESCRIPTION OF THE DRAWINGS

FIGS. **1** A–D illustrate one embodiment of the invention wherein a carton **100** having L-shaped locking slots for locking the carton in its minor end flaps is closed and locked in accordance with the present invention. This embodiment will be described with reference to closing and locking of the bottom flaps of carton **100**, but it is recognized that the invention can also be applied to closing of the top flaps of the carton.

The carton **100** shown in FIGS. **1** A–D includes a first side **112**, a second side **114**, a third side **116** and a fourth side **118**. Bottom end flaps **120**, **122**, **124** and **126** extend downward from sides **112**, **114**, **116** and **118**, respectively. As shown, flaps **120** and **124** are minor end flaps and end flaps **122** and **126** are major end flaps.

Minor end flap **120** includes an L-shaped locking slot **128** for engaging a corner portion **130** of major end flap **126**, and according to this embodiment, minor end flap **124** also has an L-shaped locking slot **132** for engaging the opposing corner portion **134** of major end flap **126** so as to lock the flaps closed as hereinafter described.

A sequence controller **136** is programmed to control the flap restraining and closing sequence in accordance with the present invention. In this embodiment, sequence controller **136** sequentially closes the first, second, third and fourth flaps **120**, **122**, **124** and **126**, respectively. Preferably, sequence controller **136** is programmable so that the timing of each of the flap biasing and closing devices hereinafter described can be changed independently, depending upon the type of bottom closure being used.

In order to provide an unobstructed path for closure of the first flap **120**, flaps **122**, **124** and **126** are biased outwardly with respect to the carton, for example, 10° from vertical, by bias arms **138**, **140** and **142**, respectively. According to this embodiment, each of the bias arms **138**, **140** and **142** are positioned by pneumatic rotary actuators **144**, **146** and **148**, respectively, under the control of sequence controller **136**. However, the bias arms can be positioned by any suitable means, such as servomotors, pneumatic air cylinders and the like.

With flaps **122**, **124** and **126** biased out of the way of flap **120**, the first flap is closed by being folded toward the interior of the carton by a first closing arm **150**. Glosing arm **150** is positioned by pneumatic rotary actuator **152** under the control of sequence controller **136**, but can be positioned by any suitable means such as a servomotor, pneumatic air cylinder or the like.

With flap **120** held in the position shown in FIG. **1**A by closing arm **150**, bias arm **138** is retracted out of the way of flap **122** by rotary actuator **144** under the control of sequence controller **136**.

Referring now to FIG. **1**B, flap **122** is then closed while flaps **124** and **126** are biased out of the way by bias arms **140** and **142**, respectively. Flap **122** is folded inward to about perpendicular to sidewall **114** by closing arm **154**, which is positioned by pneumatic rotary actuator **156** under the control of sequence controller **136**. With flap **122** held in the position shown in FIG. **1**B, closing arm **150** (shown in FIG. **1**A) can be retracted by

pneumatic rotary actuator **152** under the control of sequence controller **136** and replaced with guide bar **151**. Guide bar **151** serves to facilitate the subsequent insertion of the corner portion **130** of major end flap **126** into L-slide slot **128**. Optionally, closing arm **150** may be designed with a downwardly curved end, remain in contact with end flap **122** and serve as the guide bar.

Prior to the closing of flap **124**, bias arm **140** is retracted by pneumatic rotary actuator **146** under the control of sequence controller **136**.

Referring now to FIG. **1C**, while flap **126** is biased out of the way of flap **124** by bias arm **142**, flap **124** is folded inward to be about perpendicular with sidewall **116** by closing arm **158**. Closing arm **158** is positioned by pneumatic rotary actuator **160** under the control of sequence controller **136**. Closing arm **158** is positioned in part over L-slide slot **132** and possesses a downwardly curved terminal end toward end flap **126**. By this design, closing arm **158** also serves as a guide bar for the subsequent insertion of the corner portion **134** of major end flap **126** into L-slide slot **132**. While flap **124** is being closed by closing arm **158**, closing arm **154** can be retracted from engagement with closing flap **122** by pneumatic rotary actuator **156** under the control of sequence controller **136**.

Prior to the closing of flap **126**, bias arm **142** is retracted out of the way of closing flap **126** by pneumatic rotary actuator **148** under the control of sequence controller **136**.

The closing of the fourth flap **126** and the locking closed of the bottom of carton **100** will now be described with reference to FIG. **1D**. In accordance with this embodiment, means are provided for folding the closing flap **126** to form a longitudinal fold **162** in the closing flap **126** at a predetermined position between the bottom end **164** of side **118** of the case, and the free longitudinal edge **166** of flap **126**. Preferably, flap **126** has previously been scored along a line at the position where fold **162** is formed.

In the embodiment shown in FIG. **1D**, the closing flap folding means includes fold support rods **168** and **170** which may be piston rods of cylinders **172** and **174**, respectively, which cylinders are rigidly mounted on suitable supports (not shown). The piston rods are selectively positionable to and from a position adjacent the inside surface of flap **126** when flap **126** extends generally parallel to side **118** of the carton. The "inside surface" of flap **126** is that side of the flap facing toward the interior of the carton as distinguished from the "outside surface" which is the side of the flap facing away from the interior of the carton. Flap fold support rods **168** and **170** are selectively positionable to and from the position shown in FIG. **1D** by pneumatic cylinders **172** and **174**, respectively, each under the control of sequence controller **136**.

According to this embodiment, the closing flap folding means includes a pair of flap fold guide shoes **176***a* and **176***b*, fixedly attached to bar **178**, that fold the closing flap **126** into the position shown in FIG. **1D** when pneumatic cylinder **182**, under the control of sequence controller **136**, partially extends piston rod **180** in the direction of arrow **184**. The partial extension of piston rod **180** brings notches **186***a* and **186***b* of the guide shoes **176***a* and **176***b*, respectively, into engagement with fold line **162** of flap **126**. After which flap fold support rods **168** and **170** are withdrawn from the position shown in FIG. **1D** by pneumatic cylinders **172** and **174**, respectively, under the control of sequence controller **136**. At this point, corners **130** and **134** of flap **126** are adjacent flaps **120** and **124**, respectively, and in position to be slid into the L-shaped locking slots **128** and **132**, respectively.

Guide shoes **176***a* and **176***b* provide the means for tucking the opposite free end corners **130** and **134** of closing flap **126** into respective L-slide lock slots **128** and **132**. Shoes **176***a* and **176***b* guide the longitudinal fold **162** of closing flap **126** to a position at about a level with the top of the case to cause each of the free end corners to enter the respective L-shaped slots due to the resiliency of the folded top flap, thereby completely closing the case. This is accomplished by continued inward movement of shoes **176***a* and **176***b* from the position shown in FIG. **1D** in the direction of arrow **184** under the power of cylinder **182**. Piston rod **180** then can be retracted in preparation for the closing of the bottom of another box.

The invention also includes folded bottom closures wherein the bottom end flaps are folded in a sequence other than a fan folded sequence, such as the L-slide lock arrangement shown in FIG. **2**. In this embodiment a folded reusable carton **200** having adjacent sidewalls **212**, **214**, **216**, **218**; respective top extending end flaps **213**, **215** shown and **211**, **217** not shown in the Figure; and respective bottom extending end flaps **220**, **222**, **224**, and **226**, is disposed in an expanded position wherein adjacent sidewalls are about perpendicular.

Major bottom end flap **222** is first folded to a horizontal position about perpendicular to sidewall **214** by means discussed in FIG. **1B** above, while the remaining end flaps **220**, **224** and **226** are outwardly biased with respect to the carton sidewalls, by means not shown in the drawing. With major end flap **222** held in a folded position, the bias restraints on minor end flaps **220** and **224** are released and the minor end flaps are both folded to a horizontal position in touching contact with major end flap **222** by closing means not depicted. This configuration is shown in FIG. **2B**.

The minor end flaps **220** and **224** contain L-slide slots, **228** and **232**, respectively, positioned to engage end corners **230** and **234**, respectively, of the final closing flap, major end flap **226**.

As depicted in FIG. **2C** the L-slide lock apparatus described in FIG. **1D** bends the final closure flap **226** along a line **262** and disposes the end corners **230** and **234** of end flap **226** adjacent to L-slide slots **228** and **232**. The closing means used to fold minor end flaps **220** and **224** can also serve to guide the end corners **230** and **234** of final closure flap **226** into the L-slide slots **228** and **232**. Upon full engagement of corners **230** and **234** into L-slide slots **228** and **232**, a secure folded bottom closure is achieved, as shown in FIG. **2D**.

The invention also is applicable to boxes having end flaps of the type shown in FIGS. **3A–D**. According to this embodiment, the first flap **320** of a carton **300** differs from conventional rectangular flaps by having an inwardly inclined edge **321** on the side thereof intended to contact the final end flap after fan folding. The second and third flaps **322** and **324**, respectively, of carton **300** are conventional rectangular end flaps. The fourth end flap **326** has an inwardly inclined edge **327** which is engaged with and tucked under the inwardly inclined edge **321** of the first flap so as to lock the flaps closed after sequentially fan-folding flaps **320**, **322** and **324** as shown in FIGS. **3A–C**, respectively. To lock the flaps closed in the final step, edge **327** of flap **326** is pushed

past edge **321** of flap **320**, thereby tucking edge **327** under a portion of flap **320** to lock the flaps closed.

In FIGS. **4A–D**, a carton **400** having four adjacent sidewalls, **412**, **414** shown, and **416** and **418** not shown, and conventional rectangular dwwnwardly extending end flaps, **420**, **422**, **424** and **426**, respectively, are fan-folded in a sequence and by means as earlier described with reference to FIGS. **1A–C** above.

In addition to the above, closure arm **450** for first folded flap **420** includes a retractable edge **451** which grasps the edge of end flap **420**. FIG. **4A** shows the carton **400** having bottom closure flaps **420**, **422** and **424** in a folded position.

As shown in FIG. **4B**, final closure flap **426** is biased outward from its respective sidewall **418** (not shown). The exposed corner **421** of first folded flap **420** is retracted by grasping edge **451** of closure arm **450**, and pulled to a position about parallel with sidewall **412**.

The bias restraint on final closure flap **426** is shown released in FIG. **4C** and a closure arm **452**, which may be operated by a servomotor, pneumatic air cylinder or the like is used to fold the end flap **426** past the open, extended edge of end flap **420** and to dispose the end flap **426** in a position about perpendicular to its respective sidewall.

The grasping edge **451** of closure arm **450** releases end flap **420** and the closure arm **450** returns the end flap to a uniform folded position, now with a portion of final end flap **426** tucked inside to complete a full automated fan fold bottom closure. The secure bottom closure is depicted in FIG. **4D**.

In yet another embodiment, FIGS. **5A–D** depict a collapsible, reusable carton **500** having sidewalls **512**, **514**, **516** and **518** with upwardly extending top flaps, **513** (not shown), **515**, **517** and **519** respectively, and downwardly extending bottom flaps, **520**, **522**, **524**, **526**, respectively. Minor end flaps **520** and **524** possess angular cut-outs, **521** and **525** respectively, and tabs, **523** and **527** respectively. Major end flap **526** possesses angular side edges **529** and **531** and an extended longitudinal edge **533** that acts as a closure tab, as is described below.

As described earlier with respect to FIGS. **2A–C**, the bottom end flaps of carton **500** depicted in FIGS. **5A–C** are folded in sequence whereby major end flap **522** is first folded, FIG. **5A**; followed by in-folding minor end flap **520**, FIG. **5B**; and minor end flap **524**, FIG. **5C**. It is noted that tabs **523** and **527** are in touching contact with major end flap **522**.

A closure arm, not shown, folds final closure flap **526** inward, pushing tabs **523** and **527** and longitudinal edge **533** past the edge of the major end flap **522**. This tucks the tabs of minor end flaps **520** and **524** as well as the closure tab edge of major end flap **526** under a portion of first-folded major end flap **522** to lock the bottom flaps in a secure, closed position.

While the invention has been described with reference to specific closing sequences and folded closing arrangements, the above discussion is intended to be exemplary and not limitative of the invention. Modifications and alterations to the drawings are evident to those skilled in the art after reading this disclosure and are intended to fall under the spirit and scope of this invention, which is defined in the appended claims.

We claim:

1. A method for closing the bottom end flaps of a rectangular carton having sequentially adjacent first, second, third and fourth sides which form the body of the carton, the four sides having first, second, third and fourth bottom end flaps extending respectively therefrom, the method including the steps of:

(a) providing a carton in an expanded rectangular position having its bottom end flaps extending downward relative to the body of the carton;

(b) providing biasing means to bias said end flaps outwardly with respect to the sidewalls of the body of the carton;

(c) providing a programmable sequence controller for sequentially controlling release of the biasing means and closing of the bottom end flaps;

(d) providing closing means for closing the bottom end flaps in a preset sequence under control of the sequence controller by folding each end flap whose bias has been released towards the interior of the carton while maintaining a bias on each unfolded end flap; and

(e) providing the end flaps in a secure position by means of disposing at least two end flaps in locking relationship to each other.

2. The method of claim **1** wherein said bottom end flaps are closed in a fan folded sequence.

3. The method of claim **1** wherein the sequence of closing said bottom end flaps comprises

(a) folding a first major end flap;

(b) folding first and second minor end flaps; and

(c) folding a second major end flap.

4. The method of claim **1** wherein the locking relationship is formed with L-slide locks.

5. The method of claim **1** wherein the locking relationship is formed with fan folds.

6. The method of claim **1** wherein the locking relationship is formed with tucking tabs.

7. The method of claim **1** wherein said biasing means is a bias arm controlled by said sequence controller through means selected from the group consisting of pneumatic rotary actuators, pneumatic linear actuators, servomotors and pneumatic air cylinders.

8. The method of claim **1** wherein said closing means is a closing arm controlled by said sequence controller through means selected from the group consisting of pneumatic rotary actuators, pneumatic linear actuators, servomotors and pneumatic air cylinders.

9. A method for closing the bottom end flaps of a rectangular carton having sequentially adjacent first, second, third and fourth sides which form the body of the carton, and the four sides having first, second, third and fourth bottom end flaps extending respectively therefrom, the method including the steps of:

(a) providing a carton in an expanded rectangular position having its bottom end flaps extending downward relative to the body of the carton;

(b) providing biasing means to bias said end flaps outwardly with respect to the sidewalls of the body of the carton;

(c) providing a programmable sequence controller for sequentially controlling release of the biasing means and closing of the bottom end flaps;

(d) closing the bottom end flaps in a preset sequence of first, second, third and fourth end flaps under control of the sequence controller by releasing the bias and folding each end flap towards the interior of the carton while maintaining a bias on each unfolded end flap;

(e) retracting the exposed corner of the first end flap to a position about parallel with the first side; and

(f) providing the end flaps in a secure position by means of closing the fourth end flap by releasing

the bias and folding the fourth end flap past the retracted corner of said first end flap towards the interior of the carton, and afterwhich returning said corner of said first end flap to its closed position.

10. An apparatus for closing the bottom end flaps of a rectangular carton expanded to an open position by expanding means, said carton having sequentially adjacent first, second, third and fourth sides which form the body of the carton, the four sides having first, second, third and fourth bottom end flaps extending respectively therefrom, the apparatus comprising:

(a) means for providing said rectangular carton in said open position having its bottom end flaps extending downward relative to the body of the carton;

(b) biasing means to bias said end flaps outwardly with respect to the sidewalls of the body of the carton;

(c) a programmable sequence controller for sequentially controlling release of the biasing means and closing of the bottom end flaps;

(d) closing means for closing the bottom end flaps in a preset sequence under control of the sequence controller by folding each end flap whose bias has been released towards the interior of the carton while maintaining a bias on each unfolded end flap; and

(e) means for disposing the end flaps in a secure position by providing at least two end flaps in locking relationship to each other.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 5,066,269

DATED : November 19, 1991

INVENTOR(S) : John L. Center et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Col. 3, line 23 "i" should be --is--.

Col. 4, line 53 "Glosing" should be --Closing--.

Col. 5, line 65 "which" should be --which,--.

Col. 7, line 5 "dwwnwardly" should be --downwardly--.

Signed and Sealed this

Ninth Day of November, 1993

Attest:

BRUCE LEHMAN

Attesting Officer

Commissioner of Patents and Trademarks